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tebrates is developed from the ectoderm and in the development of the nephridia "as a rule the ciliated funnel which was present during development, becomes completely closed." P. 85. Between the ectoderm and the entoderm of the sponges "is a gelatinous layer, the mesogloea, amongst the cells of which crystals of lime salts occur," which we suppose to be the spicules, silicious as well as calcareous, of these organisms. P. 83. The animal kingdom is divided into Protozoa, and Invertebrate and Vertebrate Mesozoa. The Invertebrates are defined as follows: "They possess no backbone, the nerve cord or nerve cords are never dorsal, . . . and the heart is always placed in the dorsal region." The Invertebrata are subdivided into Cœlenterata and Cœlomata, but never a word that the Plathelminthes are not Cœlomata and that the vertebrates are. But enough. The work is well illustrated, mostly by cuts from Claus, Sachs, Prantl and other recent textbooks.

Correlation Papers of the U. S. Geological Survey Neocene.⁴—This memoir is the fifth of a series, having been preceded by essays on the Carboniferous and Devonian by Mr. Williams, on the Cambrian by Mr. Walcott, on the Cretaceous by Mr. White, and on the Eocene by Mr. Clark. To an excellent summary of published material on the subject discussed the authors have added important original matter based on personal investigations by Mr. Dall in the field and laboratory. The following is an outline of the memoir as given in the introduction:

"This paper, after discussing general principles connected with the study and description of the Tertiary or Cenozoic rocks and fossils contained in them, takes up the Neocene deposits of the United States in particular.

"A chapter is devoted to a summary of what is known in regard to the Neocene of the eastern coast of the United States, each State in geographical order being separately considered, beginning at the north. The State of Florida, in regard to which much unpublished information was available, being entirely composed of Cenozoic rocks, and therefore as a type of such structure peculiarly interesting, is treated of in greater detail and at more length than in other cases. The part of this essay relating to the State of Florida is really a preliminary geological report on that State, of which the structure has hitherto been very little known. The important fact that until the Pliocene

⁴Bulletin of the United States Geological Survey No. 84. Correlation Papers—Neocene, By W. H. Dall and G. D. Harris. Washington, 1892.

period, Florida, so far as it was elevated above the sea, was an island separated from the mainland by a wide strait, is here first demonstrated. It is also shown that the strata are probably gently folded lengthwise of the peninsula, and that in the trough now occupied by the "lake region" of Florida in Pliocene time a large lake probably existed, to which the name of De Soto has been applied. The age of the remains of fossil vertebrate animals, which in south Florida are associated with the so-called "pebble phosphates," is here definitely determined."

After discussing by States the character and distribution of the Atlantic Neocene, a chapter is devoted to the consideration of the general geological movements and fluctuations of land, sea, currents, and water temperatures which appear to have been concerned in producing the characteristics described.

"In like manner the Neocene geology of the Pacific coast has been treated, and in addition to that of California, Oregon, and Washington, a synopsis of data relating to British Columbia has been included, together with a summary of what is known in relation to Alaska during this epoch. The latter discussion contains a large amount of material extracted from unpublished notes covering some fifteen years' study and exploration by W. H. Dall in the Alaskan region, and therefore adds materially to the sum of our knowledge in regard to that part of the United States.

"The Great Interior region of the west is then taken up, and a summary of our knowledge in regard to its Neocene geology is brought together for the first time. While this is necessarily far from perfect, the very fact that such gaps exist will stimulate the collection of information to supply the missing links.

"The essay closes with a list of names proposed for geological beds, groups, and formations in the American Cenozoic strata, and a description of the data upon which the coloration of the general map is based."

The work while an eminently important and useful one, is very unsymmetrical, as the authors themselves recognize. They are very full in describing the formations that they have seen, those of Florida, for instance, and deficient in those which they have not seen, as the lacustrine formations of the interior. The latter yet remain to receive adequate treatment from the U. S. Survey, since to do this requires the aid of a competent paleontologist of the vertebrata.

The geological map of Florida contained in this volume expresses clearly the latest discoveries in that state. The coloration will surprise

geologists who supposed that Major Powell had abandoned his extraordinary position on the question of coloration of geological maps. We seem to see in Florida a good representation of the Archean, Paleozoic and Mesozoic beds, as well as the Cenozoic. For this Mr. Dall is in no way responsible. It is a pity that expense should be incurred in printing such maps, since they will have to be republished with the customary colors.

Cary on the Evolution of Foot Structure.⁵—We have in this paper a study of the fore foot of *Palæosyops*, from a specimen in the museum of Princeton College, conducted with a view of ascertaining the mechanical relations of the parts when in action. The ultimate object is to determine whether the structures presented (facets, etc), can have been produced by direct mechanical impacts, strains, etc., as is alleged by the Neolamarckian school of evolutionists. The study is conducted with care, so far as it goes, but it is not always easy to understand the drift of the author's argument. He reaches but one definite conclusion, viz.; that the trapezoid is too small to express properly a result of direct mechanical causes. This fact, the author says is incompatible with the Lamarckian principle. He informs us that in reaching this result he has applied geometrical methods. "First, the volume of the bones was got at. Next the area of the bearing surfaces and their inclination to the digits were measured. Then giving to the thrust of each metacarpal a value proportional to its volume, the distribution of that thrust can by resolution and composition of forces, be traced through the foot, and the pressure on each surface and bone approximately obtained." Further than this the author does not explain how he reached the result that the trapezoid is too small. It is quite essential that this demonstration should be given if we are expected to accept his conclusion. An essential part of the problem is, however, unnoticed by Mr. Cary; and that is the condition of the trapezoid in the reptilian ancestors of the Mammalia. The phylogeny of an element must be known, since it furnishes the "physical basis" of the problem.

Mr. Cary then proceeds to criticize the explanations offered by Professor Osborn and myself, in accounting for the origin of certain structures. He finds our explanations to be self-contradictory, and that we also contradict each other. Osborn has supposed that the conules of the molars are produced by friction of the molars of opposite

⁵A study in Foot Structure; by Austin Cary. *American Journal of Morphology* Dec. 1892, p. 305.